

# RSC Sustainability

rsc.li/rscsus

The Royal Society of Chemistry is the world's leading chemistry community. Through our high impact journals and publications we connect the world with the chemical sciences and invest the profits back into the chemistry community.

## IN THIS ISSUE

ISSN 2753-8125 CODEN RSSUAN 1(6) 1301–1568 (2023)



### Cover

See V. Bressi *et al.*, pp. 1404–1415. Image reproduced by permission of V. Bressi from *RSC Sustainability.*, 2023, 1, 1404.



### Inside cover

See Mara G. Freire, João A. P. Coutinho *et al.*, pp. 1314–1331. Image reproduced by permission of João A. P. Coutinho from *RSC Sustainability.*, 2023, 1, 1314.

## EDITORIAL

1311

### Fundamental tools for managing sustainability

Mike Sutton\*

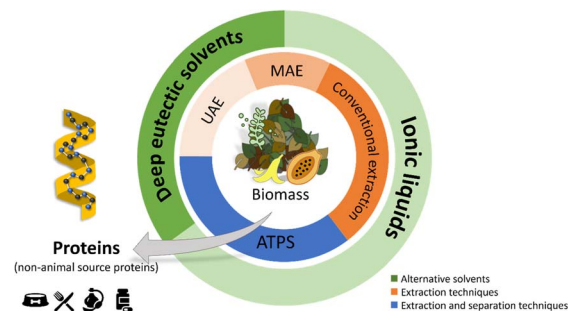


## CRITICAL REVIEWS

1314

### Towards the sustainable extraction and purification of non-animal proteins from biomass using alternative solvents

Bojan Kopilovic, Ana I. Valente, Ana M. Ferreira, Mafalda R. Almeida, Ana P. M. Tavares, Mara G. Freire\* and João A. P. Coutinho\*



## Editorial Staff

### Executive Editor

Emma Eley

### Deputy Editor

Jon Ferrier

### Editorial Production Manager

Sarah Whitbread

### Assistant Editors

Jamie Purcell, Aphra Murray, Alexander John, Emily Ellison, Jack Pitchers

### Editorial Assistant

Alex Holiday

### Publishing Assistant

Lee Colwill

### Publisher

Neil Hammond

For queries about submitted papers, please contact Sarah Whitbread, Editorial Production Manager in the first instance. E-mail: [rscsus@rsc.org](mailto:rscsus@rsc.org)

For pre-submission queries please contact

Emma Eley, Executive Editor.

E-mail: [rscsus-rsc@rsc.org](mailto:rscsus-rsc@rsc.org)

RSC Sustainability (electronic: ISSN 2753-8125)

is published 6 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

RSC Sustainability is a Gold Open Access journal and all articles are free to read. Please email [orders@rsc.org](mailto:orders@rsc.org) to register your interest or contact Royal Society of Chemistry Order Department, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK  
Tel +44 (0)1223 432398;  
E-mail: [orders@rsc.org](mailto:orders@rsc.org)

Whilst this material has been produced with all due care, the Royal Society of Chemistry cannot be held responsible or liable for its accuracy and completeness, nor for any consequences arising from any errors or the use of the information contained in this publication. The publication of advertisements does not constitute any endorsement by the Royal Society of Chemistry or Authors of any products advertised. The views and opinions advanced by contributors do not necessarily reflect those of the Royal Society of Chemistry which shall not be liable for any resulting loss or damage arising as a result of reliance upon this material. The Royal Society of Chemistry is a charity, registered in England and Wales, Number 207890, and a company incorporated in England by Royal Charter (Registered No. RC000524), registered office: Burlington House, Piccadilly, London W1J 0BA, UK, Telephone: +44 (0) 207 4378 6556.

### Advertisement sales:

Tel +44 (0) 1223 432246; Fax +44 (0) 1223 426017;

E-mail [advertising@rsc.org](mailto:advertising@rsc.org)

For marketing opportunities relating to this journal, contact [marketing@rsc.org](mailto:marketing@rsc.org)

# RSC Sustainability

[rsc.li/RSCSus](http://rsc.li/RSCSus)

*RSC Sustainability* publishes experimental and theoretical work across the breadth of materials science.

## Editorial Board

### Editor-in-Chief

Tom Welton, Imperial College London, UK

### Associate Editors

Francesca Kerton, Memorial University of Newfoundland, Canada

Haichao Liu, Peking University, China

Vincent Nyamori, University of KwaZulu-Natal, South Africa

Cristina Pozo-Gonzalo, Deakin University, Australia

Martin Precht, University of Lisbon, Portugal

Zhenyu Sun, Beijing University of Chemical Technology, China

### Editorial Board Members

David Cole-Hamilton, University of St Andrews, UK

Mike Sutton, The Lubrizol Corporation, USA

## Advisory Board

Barbara Kasprzyk-Hordern, University of Bath, UK

Jothi Kothandaraman, Pacific Northwest National Laboratory, USA

Hong Li, Nanyang Technological University, Singapore

Chen Liao, Argonne National Laboratory, USA

Shengzhong Liu, Dalian National Laboratory for Clean Energy, China

Greta Patzke, University of Zurich, Switzerland

Peter Styring, The University of Sheffield, UK

Gyorgy Szekely, King Abdullah University of Science and Technology, Saudia Arabia

Luigi Vaccaro, University of Perugia, Italy

Sónia Ventura, University of Aveiro, Portugal

Charlotte Williams, University of Oxford, UK

Iris Yu, National University of Singapore, Singapore

## Information for Authors

Full details on how to submit material for publication in RSC Sustainability are given in the Instructions for Authors (available from <http://www.rsc.org/authors>). Submissions should be made via the journal's homepage: [rsc.li/RSCSus](http://rsc.li/RSCSus)

Authors may reproduce/republish portions of their published contribution without seeking permission from the Royal Society of Chemistry, provided that any such republication is accompanied by an acknowledgement in the form: (Original Citation)–Reproduced by permission of the Royal Society of Chemistry.

This journal is © The Royal Society of Chemistry 2023.

Apart from fair dealing for the purposes of research or private study for noncommercial purposes, or criticism or review, as permitted under the Copyright, Designs and Patents Act 1988 and the Copyright and Related Rights Regulation 2003, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the Publishers or in the case of reprographic reproduction in accordance with the terms of licences issued by the Copyright Licensing Agency in the UK. US copyright law is applicable to users in the USA.

Registered charity number: 207890

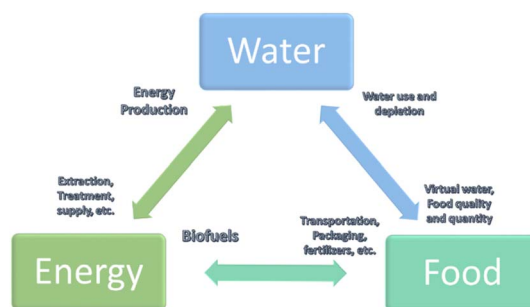


## CRITICAL REVIEWS

1332

**Sustainable design of water–energy–food nexus: a literature review**

Juan Gabriel Segovia-Hernández,\*  
Gabriel Contreras-Zarazúa and César Ramírez-Márquez

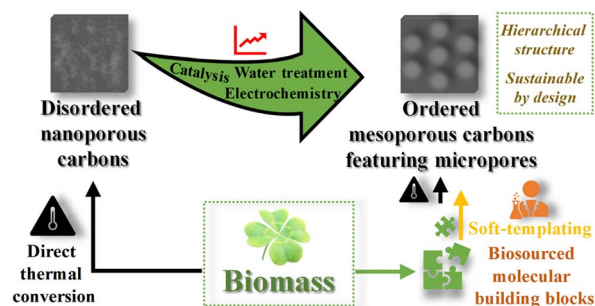


## TUTORIAL REVIEWS

1354

**A tutorial mini-review on nanoporous carbons from biosourced compounds: ordered hierarchical nanoarchitectures through benign methodologies**

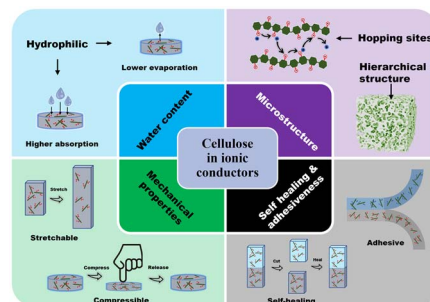
László Szabó,\* Wim Thielemans, Jin Won Seo,  
Frank Buysschaert, Dionysios D. Dionysiou  
and Veerle Vandeginste



1369

**Utilizing cellulose-based conducting hydrogels in iontronics**

Kudzanai Nyamayaro, Savvas G. Hatzikiriakos  
and Parisa Mehrkhodavandi\*



## PERSPECTIVE

1386

**Enhanced nickel catalysts for producing electrolytic hydrogen**

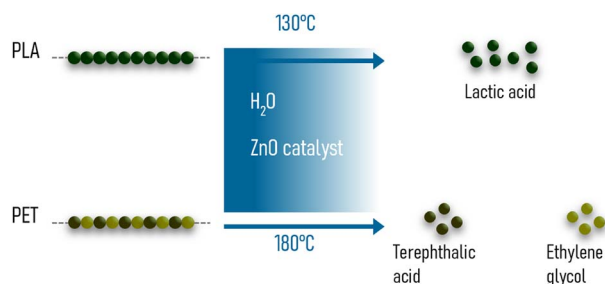
Rosaria Ciriminna\* and Mario Pagliaro\*

**Electrolytic hydrogen**  
via new generation **Ni**-based  
electrocatalysts



## COMMUNICATION

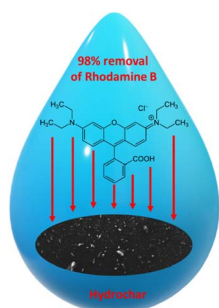
1394

**Hydrolytic depolymerisation of polyesters over heterogeneous ZnO catalyst**

Francesca Liguori, Carmen Moreno-Marrodán, Werner Oberhauser, Elisa Passaglia and Pierluigi Barbaro\*

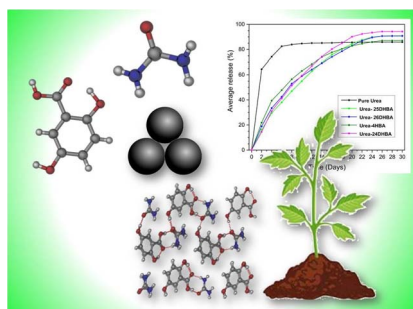
## PAPERS

1404

**Hydrochar from *Sargassum muticum*: a sustainable approach for high-capacity removal of Rhodamine B dye**

D. Spagnuolo, D. Iannazzo, T. Len, A. M. Balu, M. Morabito, G. Genovese, C. Espro and V. Bressi\*

1416

**Mechanosynthesis of urea–hydroxybenzoic acid cocrystals as sustained-release nitrogen fertilizer**

Trishna Rajbongshi, Shalika Parakatawella, Diptajyoti Gogoi, Poonam Deka, Nadeesh M. Adassooriya and Ranjit Thakuria\*

1423

**Industrial lignins as efficient biosorbents for Cr(VI) water remediation: transforming a waste into an added value material**

Marianna Vescovi, Matteo Melegari, Cristina Gazzurelli, Monica Maffini, Claudio Mucchino, Paolo Pio Mazzeo, Mauro Carcelli, Jacopo Perego, Andrea Migliori, Giuliano Leonardi, Suvi Pietarinen, Paolo Pelagatti\* and Dominga Rogolino\*

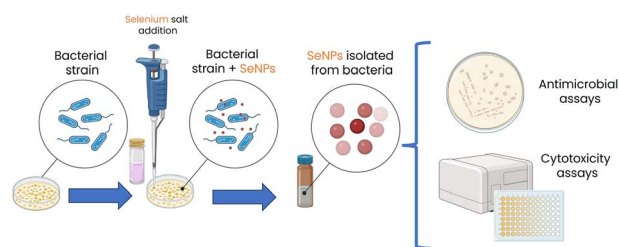


## PAPERS

1436

### Bacterial-mediated selenium nanoparticles as highly selective antimicrobial agents with anticancer properties

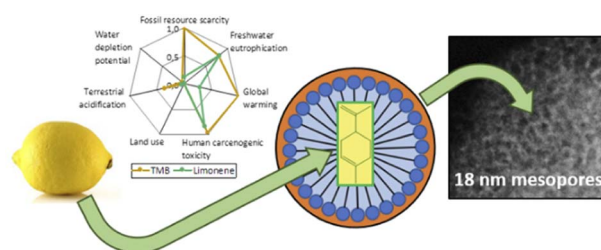
David Medina-Cruz, Linh B. Truong, Eduardo Sotelo, Lidia Martínez, María Ujué González, Yves Huttel, Thomas J. Webster, José Miguel García-Martín and Jorge L. Cholula-Díaz\*



1449

### Substituting fossil-based with bio-based chemicals: the case of limonene as a greener pore expander for micellar templated silica

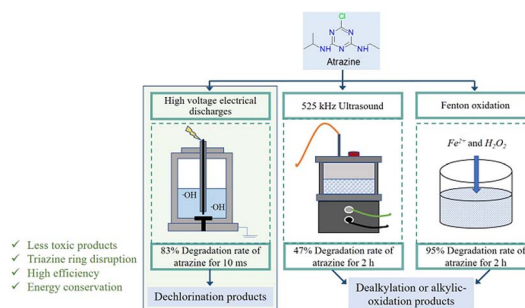
Umair Sultan, Katrin Städtke, Andreas Göpfert, Daniel Lemmen, Ezzeldin Metwali, Santanu Maiti, Carola Schlumberger, Tadahiro Yokosawa, Benjamin Apele Zubiri, Erdmann Spiecker, Nicolas Vogel, Tobias Unruh, Matthias Thommes and Alexandra Inayat



1462

### Degradation of herbicide atrazine in water by high voltage electrical discharge in comparison with Fenton oxidation and ultrasound treatments

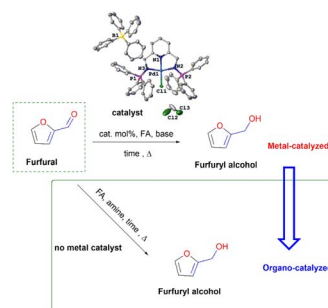
Junting Hong, Nadia Boussetta, Gérald Enderlin, Franck Merlier and Nabil Grimi\*



1471

### Convenient hydrogenation of furfural to furfuryl alcohol in metal-catalyzed and organo-catalyzed environments

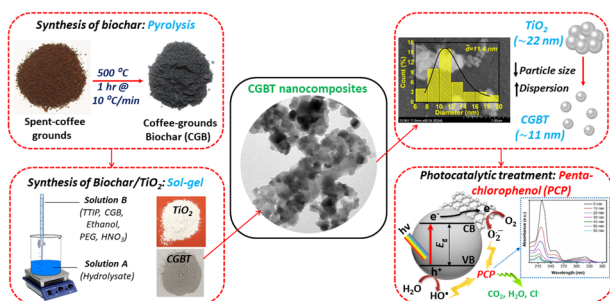
Asanda C. Matsheku, Munaka Christopher Maumela and Banothile C. E. Makhubela\*





## PAPERS

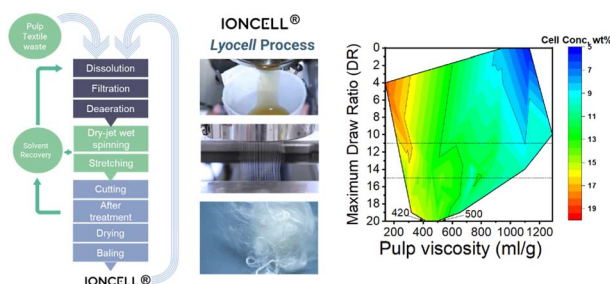
1484



### Spent-coffee grounds-derived biochar-supported heterogeneous photocatalyst: a performance evaluation and mechanistic approach for the degradation of pentachlorophenol

Rahil Changotra, Himadri Rajput, Jie Yang, Mita Dasog\* and Quan (Sophia) He\*

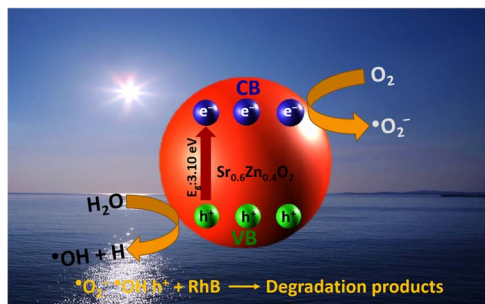
1497



### Influence of DP and MMD of the pulps used in the IONCELL® process on processability and fiber properties

Yibo Ma,\* Xiang You, Kaarlo Nieminen, Daisuke Sawada and Herbert Sixta\*

1511

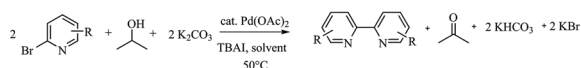


### Effective photocatalytic degradation of rhodamine-B over Zn-doped BaO<sub>2</sub> and SrO<sub>2</sub> composites under UV and sunlight irradiation

Kirankumar Venkatesan Savunthari, Daneshwaran Balaji, Nivedita Sudheer, Mittal Bathwar, Manjunath Rangasamy, Ganesh Kumar Dhandabani, Alain R. Puente Santiago, Sumathi Shanmugam,\* Kien-Voon Kong\* and Vijayaraghavan R\*

1522

### Improved 2-Pyridyl Reductive Homocoupling Reaction Using Biorenewable Solvent Cyrene™ (dihydrolevoglucosenone)



#### Conclusions:

- Reductive homocoupling reactions proceed faster in Cyrene™ and Cyrene™ blends than in dimethylformamide
- The formation of a 2,2'-bipyridyl product accelerates the reaction rate

### Improved 2-pyridyl reductive homocoupling reaction using biorenewable solvent Cyrene™ (dihydrolevoglucosenone)

Daniel A. Webb, Zeid Alsudani, Guolin Xu, Peng Gao and Leggy A. Arnold\*

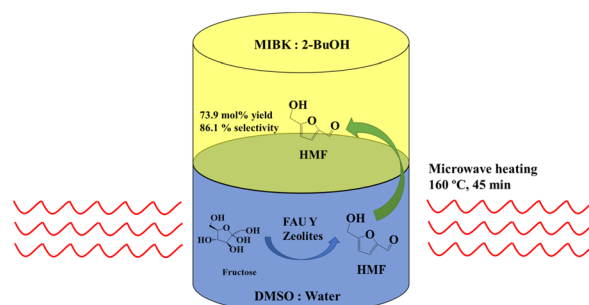


## PAPERS

1530

### Hierarchical zeolite catalysed fructose dehydration to 5-hydroxymethylfurfural within a biphasic solvent system under microwave irradiation

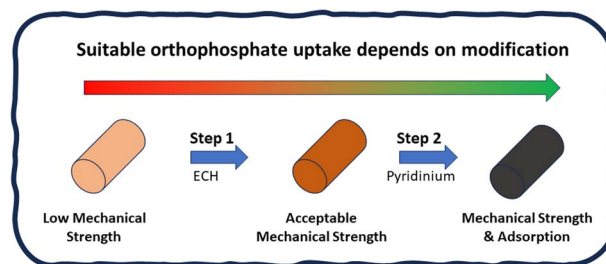
Huaizhong Xiang, Shima Zainal, Henry Jones, Xiaoxia Ou, Carmine D'Agostino, Jesús Esteban,\*  
Christopher M. A. Parlett\* and Xiaolei Fan\*



1540

### Pyridinium-furfuryl-modified granular agro-waste adsorbent for orthophosphate recovery

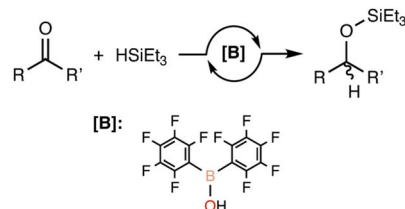
Bernd G. K. Steiger and Lee D. Wilson\*



1547

### Exploration of bis(pentafluorophenyl)borinic acid as an electronically saturated, bench-top stable Lewis acid catalyst

Taylor P. L. Cosby and Christopher B. Caputo\*

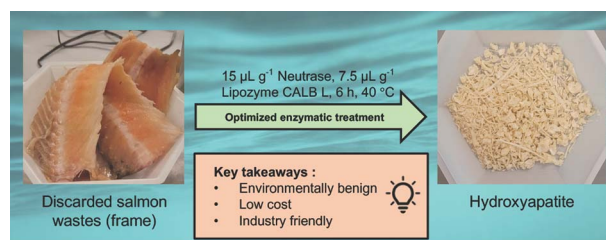


- Lewis acidity assessed
- Stability of borane catalysts explored towards air and moisture
- Catalysis shown under ambient conditions, in undried solvents, and benchmarked to state-of-the-art Lewis acid catalysts

1554

### Isolation of hydroxyapatite from Atlantic salmon processing waste using a protease and lipase mixture

Sarah Boudreau, Sabahudin Hrapovic, Yali Liu, Alfred C. W. Leung, Edmond Lam\*  
and Francesca M. Kerton\*



## CORRECTION

1565

**Correction: Removal of metals and inorganics from rendered fat using polyamine-modified cellulose nanocrystals**

Ezequiel Vidal, Frank Alexis, José M. Camiña, Carlos D. Garcia\* and Daniel C. Whitehead\*

